

What is claimed:

- 1 1. A method for manufacturing a semiconductor chip, the method comprising
2 forming an electrode on a first surface of a semiconductor chip, and then digging a hole
3 from a second surface of the semiconductor chip until the electrode is exposed.
- 1 2. A method as in claim 1, wherein the second surface is located opposite to the
2 first surface.
- 1 3. A method as in claim 2, wherein the electrode is formed to include a first
2 layer and a second layer, and the hole contacts the first layer of the electrode.
- 1 4. A method for manufacturing a semiconductor chip, the method comprising:
2 forming an electrode on a surface of a first semiconductor chip and thereafter forming a hole
3 from another surface of the first semiconductor chip until the electrode is exposed, forming a
4 protrusion by etching a surface of a second semiconductor chip and thereafter forming an
5 abutting electrode on an apex section of the protrusion, and positioning the first
6 semiconductor chip and the second semiconductor chip such that the abutting electrode
7 contacts the electrode.
- 1 5. A method as in claim 4, wherein forming a hole from another surface
2 comprises forming the hold from a surface that is opposite to the surface the electrode was
3 formed on.
- 1 6. A method for manufacturing a semiconductor device, the method comprising:
2 forming a metal film on a surface of a first semiconductor chip, forming a hole by an anodic
3 forming method using a dielectric layer coated on an opposite surface of the first
4 semiconductor chip as a mask, thereafter removing the metal film, and forming an electrode
5 on a portion of the surface of the first semiconductor chip in a manner to embed the hole.

1 7. A method for manufacturing a semiconductor device according to claim 2,
2 wherein, after the hole is formed, a metal film is formed on the electrode from the opposite
3 surface.

1 8. A method for manufacturing a semiconductor device according to claim 3,
2 wherein, after the hole is formed, a metal film is formed on the electrode from the opposite
3 surface.

1 9. A semiconductor chip comprising an electrode formed on a first surface
2 thereof and a hole that exposes the electrode through a second surface thereof.

1 10. A semiconductor chip according to claim 9, wherein the second surface is
2 located opposite to the first surface.

1 11. A semiconductor device comprising: a first semiconductor chip having a first
2 electrode formed on a surface thereof and a hole through the first semiconductor chip that
3 exposes the electrode, and a second semiconductor chip having a protrusion for insertion in
4 the hole through the first semiconductor chip and an abutting electrode on the protrusion
5 adapted to contact the first electrode.

1 12. A semiconductor device according to claim 11, wherein the first
2 semiconductor chip and the second semiconductor chip have a crystal orientation face of
3 (100).

1 13. A semiconductor device according to claim 11, wherein the first
2 semiconductor chip and the second semiconductor chip have a crystal orientation face of
3 (110).

1 14. A semiconductor device according to claim 11, wherein a metal film is
2 coherently formed on a surface of the first electrode, and the first electrode and the abutting
3 electrode are brought in contact with each other through the metal film.

1 15. A connection substrate comprising the semiconductor device set forth in
2 claim 11.

1 16. An electronic apparatus comprising a connection substrate set forth in claim
2 15.

1 17. A semiconductor device including
2 a first substrate having a first electrode thereon;
3 an opening extending through said first substrate, the opening positioned so that the
4 first electrode extends across the opening;
5 a second substrate including a protrusion on which a second electrode is located;
6 wherein the protrusion extends into the opening and the second electrode is
7 electrically connected to the first electrode.

1 18. A semiconductor device as in claim 17, further comprising an conducting
2 adhesive disposed between the first electrode and the second electrode.

1 19. A semiconductor device as in claim 17, further comprising a metal layer
2 between the first electrode and the second electrode.

1 20. A semiconductor device as in claim 17, further comprising a dielectric layer
2 on a surface of the first substrate that faces the second substrate to electrically separate
3 portions of the first substrate from the second substrate.

1 21. A semiconductor device as in claim 17, wherein the first electrode and
2 second electrode are in direct contact with each other.

1 22. A method for forming a semiconductor device comprising:
2 forming a first electrode on a first surface of a first substrate;
3 forming an opening from a second surface of the first substrate to the first surface,
4 wherein a portion of the first electrode is exposed through the opening;
5 forming a second electrode on a second substrate;
6 positioning the second electrode in the opening and electrically connecting the first
7 electrode to the second electrode.

1 23. A method as in claim 22, further comprising forming a dielectric layer on at
2 least one of the first substrate and second substrate and positioning the dielectric layer to
3 prevent a short circuit between the first substrate and second substrate.